engineering fracture mechanics

List of Contents and Author Index
Volume 26, 1987

PERGAMON PRESS

OXFORD · NEW YORK
BEIJING · FRANKFURT · SÃO PAULO · SYDNEY · TOKYO · TORONTO

EFM 26:6-X

engineering fracture mechanics

An International Journal

EDITOR-IN-CHIEF

PROFESSOR HAROLD LIEBOWITZ

School of Engineering and Applied Science,
The George Washington University,
Washington, DC 20052, U.S.A.

EDITORIAL ADVISORY BOARD

PROFESSOR S. N. ATLURI
Georgia, U.S.A.
DR. ZDENEK BILEK
Brno, Czechoslovakia
PROFESSOR BRUNO A. BOLEY
Illinois, U.S.A.
DR. DAVID BROEK
Ohio, U.S.A.
PROFESSOR JANNE CARLSSON
Stockholm, Sweden
PROFESSOR G. P. CHEREPANOV
Moscow, U.S.S.R.
PROFESSOR H. T. CORTEN
Illinois, U.S.A.
DR. J. R. DAVIDSON
Virginia, U.S.A.
DR. THEODOR GAYMANN
Munich, Federal Republic of Germany
DR. GEORGE T. HAHN
Ohio, U.S.A.
PROFESSOR GEORGE HERRMANN
California, U.S.A.
PROFESSOR D. L. JONES
Washington, D.C., U.S.A.
PROFESSOR HIROSHI KIHARA
Tokyo, Japan
DR. J. M. KRAFFT
Virginia, U.S.A.
PROFESSOR FRANK A. McCLINTOCK
Massachusetts, U.S.A.
DR. HENRI P. van LEEUWEN
Amsterdam, The Netherlands
PROFESSOR A. J. McEVILY
Connecticut, U.S.A.
DR. BRIAN MULLINS
Hants., U.K.
PROFESSOR JAROSLAV NEMEC
Prague, Czechoslovakia
DR. NICHOLAS PERRONE
Maryland, U.S.A.
DR. Y. RAJAPAKSE
Virginia, U.S.A.
DR. J. SCHIJVE
Delft, The Netherlands
DR. WALTER SCHUTZ
Ottobrunn, Federal Republic of Germany
PROFESSOR GEORGE C. SIH
Pennsylvania, U.S.A.
PROFESSOR JAN-HAN YANG
Washington, D.C., U.S.A.
PROFESSOR TAKEO YOKOBORI
Sendai, Japan
ROBERT E. ZINKHAM
Virginia, U.S.A.

Publishing, Subscription and Advertising Offices: Pergamon Journals Ltd., Headington Hill Hall, Oxford OX3 0BW, England; or Pergamon Journals, Inc., Fairview Park, Elmsford, NY 10523, U.S.A.

Annual Subscription Rates (1987)
Annual Institutional subscription rate (1987) DM 2350.00. Two year institutional rate (1987/88) DM 4465.00. Personal subscription rate for those whose library subscribes at the regular rate (1987) DM 257.00. Prices are subject to change without notice.

Published 18 Times Per Annum (Three volumes 1987). Subscription enquiries from customers in North America should be sent to Pergamon Journals Inc., Maxwell House, Fairview Park, Elmsford, NY 10523, U.S.A. and for the remainder of the world to Pergamon Journals Ltd., Headington Hill Hall, Oxford OX3 0BW, England.

Microform Subscriptions & Back Issues. Back issues of all previously published volumes are available in the regular editions and on microfilm and microfiche. Current subscriptions are available on microfiche simultaneously with the paper edition and on microfilm on completion of the annual index at the end of the subscription year.

Copyright © 1987 Pergamon Journals Ltd.

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organisations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means electronic, electrostatic, magnetic tape, mechanical photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying information for users in the U.S.A. The Item-Fee code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law is paid. The appropriate remittance of $3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-Fee Code for this publication is: 0013-7944/87 $3.00 + .00

The cover picture was taken by Dr. Erwin Sommer in his studies at the Ernst Mach Institute in Freiburg, Germany, in work under the direction of Dr. F. Kerkhof. Dr. Sommer is Director of Fraunhofer-Institut Fuer Werkstoffmechanik, Rosastraße, 9, 7800 Freiburg, Germany.

Headington Hill Hall,
Oxford OX3 0BW

PERGAMON JOURNALS

Maxwell House, Fairview Park,
Elmsford, NY 10523

List of Contents

NUMBER 1

P. K. Liaw, T. R. Leax, T. R. Fabis and J. K. Donald	1	Fatigue crack growth behavior in an Mn–Cr austenitic steel
A. A. Rubinstein	15	Semi-infinite array of cracks in a uniform stress field
G. L. Chen and R. Roberts	23	Fatigue crack propagation for defects near a free surface
Z. Milosevic, C. Bathias and A. Pellissier-Tanon	33	Ductile crack growth of surface cracks in thin welded joints of an aluminium alloy 7020 T 6
Z. P. Bažant, S.-G. Lee and P. A. Pfeiffer	45	Size effect tests and fracture characteristics of aluminum
H. Tian-Hu	59	An exact elastic–perfect plastic solution of antiplane parallel periodical crack field
A. A. Sukere	65	The stress intensity factors of internal radial cracks in rotating disks by the method of caustics
S. W. Yu and Z. Jin	75	On the equivalent relation of the line spring model: a suggested modification
T. Kobayashi, I. Yamamoto and M. Niinomi	83	On the accuracy of measurement of dynamic elastic–plastic fracture toughness parameters by the instrumented Charpy test
A. Dumanis-Modan and A. F. Grandt, Jr	95	Development of a side-grooved crack gage for fleet tracking of fatigue damage
J. Eftis	105	On the fracture stress for the inclined crack under biaxial load
N. Fares and V. C. Li	127	An indirect boundary element method for 2-D finite/infinite regions with multiple displacement discontinuities
A. Carpinteri	143	Stress-singularity and generalized fracture toughness at the vertex of re-entrant corners
		Letter to the Editor
Z. Hashin	157	Comments on the fatigue failure criterion of the mixed model
		Announcements
	159	Symposium on Fracture

	160	Fourth International Conference on Tall Buildings Hong Kong & Shanghai April/May 1988
	161	International Conference on Robotics
	I	Software Survey Section

NUMBER 2

X. Niu, G. Li and **H. Lee**	163	Hardening law and fatigue damage of a cyclic hardening metal
J. Aboudi and **Y. Benveniste**	171	The effective moduli of cracked bodies in plane deformations
T. J. Boone, P. A. Wawrzynek and **A. R. Ingraffea**	185	Finite element modelling of fracture propagation in orthotropic materials
P. K. Poulose	203	Determination of fracture toughness from thin side-grooved specimens
G. P. Gibson	213	The use of alternating current potential drop for determining J-crack resistance curves
W. J. Mills	223	Fracture toughness of two Ni–Fe–Cr alloys
H. F. Nied	239	Thermal shock in an edge-cracked plate subjected to uniform surface heating
D. Z. Zhang and **H. Wang**	247	On the effect of the ratio a/W on the values of δ_i and J_i in a structural steel
P. S. Theocaris	251	Paradoxes in the deformation modes of crack flanks due to shear
R. H. Dodds, Jr and **D. T. Read**	267	Stress intensity factors for cracks in panels with uniformly spaced holes
G. B. Sinclair and **A. E. Chambers**	279	Strength size effects and fracture mechanics: what does the physical evidence say?
		Technical Note
M. Ichikawa	311	A note on mixed mode energy release rate
	I	Software Survey Section

NUMBER 3

N. Tsangarakis	313	All modes fracture toughness of two aluminum alloys
B. K. Neale and E. K. Priddle	323	J-integral functions of a compact tension specimen for fracture and fatigue analysis
N. E. Dowling	333	J-integral estimates for cracks in infinite bodies
Y. Furuya and H. Shimada	349	Local crack-tip strain approach to fatigue crack propagation
C. R. Pratap and R. K. Pandey	357	A composite crack profile model for CTOD determination—I. A theoretical analysis
N. A. B. Yehia and M. S. Shephard	371	The NT-criterion for predicting crack growth increments
L. Yunlin	383	A new method for measuring the shape and size of the plastic zones around slit ends—the direct showing method
X.-S. Xing	393	Nonequilibrium statistical theory of fatigue fracture
E. Smith	421	The effect of multiple circumferential through-wall cracks in the same cross-section on the fracture instability of a stainless steel pipe subject to bending deformation
M. Yoda	425	The effect of the notch root radius on the J-integral fracture toughness under modes I, II and III loadings
F. Minami, M. Toyoda and K. Satoh	433	A probabilistic analysis on thickness effect in fracture toughness
R. Hoff, C. A. Rubin and G. T. Hahn	445	Viscoplastic finite element analysis of rapid fracture
R. N. L. Smith	463	Second-order terms and strain energy density for the angled crack problem
		Technical Note
P. Lukáš	471	Stress intensity factor for small notch-emanated cracks
	I	Software Survey Section

NUMBER 4

H. Sehitoglu	475	Crack-growth studies under selected temperature–strain histories
A. Neimitz and **E. C. Aifantis**	491	On the size and shape of the process zone
A. Neimitz and **E. C. Aifantis**	505	On the length of crack jump during subcritical growth
S. L. Pu and **G. T. Sha**	519	The Bauschinger effect of reverse yield stress reduction on radial crack growth of a cylindrical pressure vessel
Z. Yishu	533	A strain energy criterion for mixed mode crack propagation
B. A. Crouch and **J. G. Williams**	541	Application of a dynamic numerical solution to high speed fracture experiments—I. Analysis of experimental geometries
B. A. Crouch and **J. G. Williams**	553	Application of a dynamic numerical solution to high speed fracture experiments—II. Results and a thermal blunting model
J. Eftis	567	Load biaxiality and fracture: a two-sided history of complementing errors
T. M. Mower and **V. C. Li**	593	Fracture characterization of random short fiber reinforced thermoset resin composites
Zhang Yongyuan, Luo Gangming and **Wu Ronghua**	605	Investigation in improving the computational accuracy of local "uncracked stress" in pipe-shaped structure using isoparametric boundary element method
Zhang Yongyuan and **Feng Wei**	611	Investigation in weighted function and optimization of isoparametric singular boundary elements' size in 3-D crack problem
		Technical Note
M. N. Bassim, M. R. Bayoumi and **D. Shum**	619	Study of the variation of fracture toughness with loading rate using compact tension specimens
	I	Software Survey Section

NUMBER 5

H. D. Mejías and L. A. de Vedia	625	Influence of side grooving on crack arrest toughness of C–Mn steels
J. Aboudi	637	Stiffness reduction of cracked solids
A. C. Chrysakis	651	Improvement of the $\max \sigma_r$, $\max \lvert\tau_{r\theta}\rvert$ and $\max \sigma_1$ criteria for mixed mode fracture
H. Abe and S. Shimoyashiki	657	Time dependent crack growth of Type 304 stainless steel in elevated temperature sodium
M. Skorupa, H. Braam and J. Prij	669	Applicability of approximate K_I solutions towards cracks at weld toes
Z. Yishu	683	Griffith's criterion for mixed mode crack propagation
J. W. Eischen	691	An improved method for computing the J_2 integral
X. Niu and G. Glinka	701	On the "limitations of the Petroski–Achenbach crack opening displacement approximation for the calculation of weight function"—do they really exist?
H. Lauschmann	707	A stochastic model of fatigue crack growth in heterogeneous material
Y. Z. Chen and Y. K. Cheung	729	Stress singularity coefficients in an infinite plate containing rigid line and applied by concentrated forces
A. K. Wong and R. Jones	741	A numerical study of two integral type elasto-plastic fracture parameters under cyclic loading
P. S. Theocaris	753	The internal crack in an extended or compressed plate: its geometric characteristics
P. M. Toor	771	On damage tolerance design of fuselage structure–circumferential cracks
		Technical Note
N. I. Ioakimidis	783	Validity of the hypersingular integral equation of crack problems in three-dimensional elasticity along the crack boundaries
	I	Software Survey Section

NUMBER 6

H. Nayeb-Hashemi and **M. E. Taslim**	789	Effects of the transient Mode II on the steady state crack growth in Mode I
E. P. Chen	809	Discussion of "A central crack at the interface between two different media for the opening mode" by X. S. Zhang
C. R. Pratap and **R. K. Pandey**	811	Composite crack profile model for CTOD determination III: An experimental application to elastic–plastic crack growth situations
D. K. Shetty, A. R. Rosenfield and **W. H. Duckworth**	825	Mixed-mode fracture in biaxial stress state: application of the diametral-compression (Brazilian disk) test
T. Hoshide and **D. F. Socie**	841	Mechanics of mixed mode small fatigue crack growth
G. P. Nikishkov and **S. N. Atluri**	851	An equivalent domain integral method for computing crack-tip integral parameters in non-elastic, thermo-mechanical fracture
J. Llorca and **V. Sanchez-Galvez**	869	Fatigue threshold determination in high strength cold drawn eutectoid steel wires
E. E. Gdoutos and **N. Hatzitrifon**	883	Growth of three-dimensional cracks in finite-thickness plates
M. P. Connolly and **R. Collins**	897	The measurement and analysis of semi-elliptical surface fatigue crack growth
J.-P. Zhang and **D. Venugopalan**	913	Effects of notch radius and anisotropy on the crack tip plastic zone
J. Zuidema, P. J. M. Mense and **R. A. H. Edwards**	927	Environmental dependence of fatigue crack growth retardation following a single overload in 2024-Al alloy
C. B. Østervig	937	Stress intensity factor determination from isochromatic fringe patterns—a review
G. A. Papadopoulos	945	The influence of geometry of edge-cracked plates on crack initiation
	I	Software Survey Section